THE AERONAUTICAL JOURNAL.

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The Aeronautical Journal.

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NOTICES OF The Aeronautical Society.

The Council have elected the following gentlemen Members of the Society :—

MR. HENRY MORDEN BENNETT, M.A., Oxon.

MR. ROBERT BROUN.

MR. ALFRED ELEY PRESTON, C.E.

MR. PATRICK Y. ALEXANDER.

GENERAL MEETING.

The next General Meeting of the Aeronautical Society will be held in the rooms of the Society of Arts, John Street, Adelphi, on Tuesday, July 17th. The chair will be taken at 8 p.m., by Major H. C. Roberts. The following papers will be read :—

1. "Cloud Photography from Balloon," by the Rev. J. M. Bacon, illustrated by photographic lantern slides.
2. "Portable Electric Balloon Signalling in War," by Mr. Eric Stuart Bruce, M.A., Oxon., illustrated by lantern views, working models, and experiments.
3. "The Weczera Flying Machine," by Mr. L. W. Broadwell, with exhibition of the model of the machine, which has lately arrived from Hungary.
4. Foreign Communication.—Dr. K. Danilewsky's Flying Machine, illustrated by photographs supplied by the inventor.

During the evening some lantern views depicting Major Baden-Powell's latest kite experiments at the front will be projected on the screen.

N.B.—For this meeting a date has been arranged as late as possible in the season in the hopes that Major Baden-Powell may return in time to take part in the proceedings.

ANNUAL SUBSCRIPTIONS.

The Annual Subscriptions to the Aeronautical Society are now due. Those members who have not yet paid their Annual Subscriptions are requested to forward them to the Honorary Secretary, *pro tem.*, 19, Campden House Road, Kensington, London, W. The attention of those members is called to Rule IVA., which states that the privileges of members extend only to those who have paid their subscriptions for the current year.

ERIC STUART BRUCE,

Honorary Secretary, pro tem.

Lord Rayleigh on Flight.

Seldom has the announcement of any lecture in the programme of the Royal Institution awakened such curiosity as Lord Rayleigh's Friday evening discourse on "Flight." Not a few on entering the lecture Theatre expected to see on the classic lecture table a new and elaborate model expressing the ideas of the Professor of Natural Philosophy on the subject which has such a fascination for the student of aeronautics. Some also hoped that the expected model would be unlike most models of flying machines and really fly round the theatre. But from the days when Faraday delighted audiences by illustrating the laws of nature with his simple yet dexterous devices, simplicity has been the favourite method of

illustration in the discourses of the Royal Institution and in Lord Rayleigh's discourse the flying machine was merely represented by the well-known toy invented long ago by Penaud, in which the stored energy of twisted indiarubber bands when liberated acts upon a little propeller wheel made of a couple of feathers. This little machine hovers in the air for a few seconds, and, simple as it is, has been called by Mr. Langley, the father of the modern flying machine. This, in Lord Rayleigh's opinion, represents a flying machine as truly as anything devised by modern inventors.

The lecture was divided into two parts, 1, Natural Flight; 2, Artificial Flight. Lord Rayleigh's remarks on the former were confined to those difficult problems which are connected with the soaring or sailing flight of birds, a subject which has raised up much controversy between naturalists and mechanicians, but which has been considerably elucidated by Lord Rayleigh's own observations.

Many birds are able to maintain themselves in the air with hardly any visible flapping of their wings. This process, which has so puzzled both naturalists and mechanicians, is undoubtedly due to the aid which the bird obtains from various motions of the atmosphere. Lord Rayleigh stated that it is impossible for a bird to maintain itself when the air is moving in a uniform and horizontal manner any more than it could if the air was absolutely still. This is a point which has been generally overlooked, though it may be easily understood by any mechanician. It becomes a question of relative motion. It may, in fact, be laid down as a certainty that when birds soar with out stretched and apparently immovable wings for any length of time without coming near the ground, that the air in which they are soaring is not moving uniformly and horizontally. Three cases are mentioned in illustration of this fact: 1. When there is a vertical component in the wind. This is probably the commonest case. As an example of birds being supported in the air by means of vertical currents, Lord Rayleigh describes observations he made on the flight of sea gulls in the north of Madeira, where cliffs of 1,000 feet in height are exposed to the wind. He describes how birds fly up these cliffs without any visible means of propulsion, being in fact blown up by a rising current of air. Such rising currents are invariably produced whenever a wind blows across a level current and meets with an obstacle, such as a cliff. The air rises to surmount it, and on the windward side there is an ascending current of air. Lord Rayleigh has also frequently observed the upward currents in India. There he frequently saw large crows floating about on the windward side of the large rocks, maintaining their position easily without work by taking advantage of these upward currents.

Incidentally, it may be mentioned that an instance of such a vertical current of air caused by wind meeting with an obstruction is mentioned in General H. Schaw's paper on the vertical circulation of the atmosphere, published in the quarterly journal of the Royal Meteorological Society, October, 1899, page 312. It is mentioned that at the south end of the great harbour of Wellington, in New Zealand, there rises a steep ridge, over which a north wind must rise as it leaves the harbour. In this case this vertical circulation was made evident by its effect on a barometer, and not by the supporting of birds.

2. When the wind is not uniform. In tropical countries large birds of prey, like vultures, are seen to soar and maintain themselves at great heights, observing their prey from great distances, and then to watch for their opportunity of descending to seize it. These cases do not appear to be capable of being explained by the action of vertical currents. Some years ago Lord Rayleigh pointed out that the apparent cause of the soaring was the non-uniformity of the wind. It is known that the wind blows at different speeds in different parts of the atmosphere, and that generally the upper currents are stronger than the lower ones. For the sake of simplicity it may be supposed that up to a certain level the wind blows at a certain speed, and above that level at a greater speed. It may also be supposed that the air below that stratum is wind in one direction, and above wind in the opposite direction. A bird finding itself near the level of the stratum, but near the plane of transition from the one stratum to the other, takes advantage of these two different velocities so as to maintain itself in the air without effort on its own part.

Lord Rayleigh thinks that such a process is used very generally by birds, and particularly by birds which skirt the sea and fly low like the albatross. This bird coming low gets into the stratum of air moving slowly, and then goes higher and gets into the stratum where the wind is higher, and that allows it to maintain itself for a long time without any muscular effort of the wings.

In reference, however, to this opinion that the soaring of birds at great heights cannot be

carried on by vertical currents, might it not be sometimes explained by the existence of those vertical currents suggested by General Schaw in the paper above quoted, and which he thinks are produced by the meeting in the lower atmosphere of two opposing currents of air, "which by the condensation of water vapour and the consequent liberation of heat, ascend in a gyratory manner caused by the rotation of the earth?"

It seems certain that when a gale is blowing the bird is able to maintain his position relatively to the ground, and even to advance against the wind without flapping its wings. This can only be done by the bird taking advantage of the gustiness of the wind. When the wind freshens the relative velocity of the bird increases, and when it falls the relative velocity decreases.

Concerning artificial flight, Lord Rayleigh pointed out that the main problem of the flying machine is the problem of the aerial plane. It is necessary to consider what are the forces that act on a plane when it is exposed obliquely to the wind. The problem of the aerial plane is the vital problem in the question of the flying of kites, because the action of the kite depends upon the incidents of wind upon an inclined surface, and that is an essential question. But in one respect, however, a kite is utterly different from the flying machine, inasmuch as it is essentially anchored to the ground. There is a relative motion of the air, relative to the ground, and it is upon that relative motion that the flying of the kite depends. When we cut the aeroplane adrift from the ground and do away with the string, the problem becomes quite a different one, and we have to consider how maintenance can be obtained in such a case. Concerning scientific kites, which are so much to the front at the present moment, Lord Rayleigh fully recognises their importance as a means of research, nor did he forget to mention the name of Major Baden-Powell in his lecture as the originator of the war kite. In Lord Rayleigh's youth, kite-flying was one of his favourite pastimes, and within the last few years he has returned to the pleasures of his youth with the delight and additional experience that has been gained. In his experiments he has used two forms of kites, one being the Malay kite, which is more like the ordinary known form of kite than those of modern date, the other being the box kite, invented by Mr. Hargrave. Both these forms of kites have no tails, for no circumspect kite-flyer will fly a kite nowadays with tails. The tail is bad from a mechanical point of view, and tends to drag the kite down. It adds to the stability of the kite, but there are other ways of securing that. The principal point of getting stability is that the surface of the kite should be convex to the wind. The chief merit of the Hargrave kite is that it is extremely stable in the air. This is accomplished by the use of the side vanes, which, when the kite gets a little out of wind, tends to bring it back again. Lord Rayleigh has had that form of kite flying with more than half a mile of steel wire, and it has taken that wire up to a considerable angle. He measured on one occasion that the wire was inclined at an angle as great as 70 deg. to the horizon, so that it had the effect of going almost overhead. Lord Rayleigh considers that the hexagonal form of kite devised by Major Baden-Powell has the great advantage of portability compared with the awkwardness of structure of the Hargrave kite. Readers will find the subject of the form of kites exhaustively treated in Major Baden-Powell's own paper on kites, read before the Society of Arts on March 2nd, 1898, and which was reprinted in this journal, April, 1898.

In connection with the action of wind on an aeroplane, Lord Rayleigh showed some refined experiments in illustration of the curious effects that are obtainable from a plane exposed obliquely to the wind. For instanee, in the mouth of a resonator he suspended a light mirror by a silken thread, from which a spot of light could be reflected on to a screen. When a tuning-fork was sounded a rapid flow of air in and out of the resonator began, and the mirror set itself transversely across the aperture so as to make the utmost possible obstacle to the flow of the air, an effect rendered visible to the audience by the movement of the reflected spot of light on the screen. Regarding the pressure of wind on a plane surface, if the latter is falling vertically at the rate of four miles an hour, and also moving horizontally at the rate of 20 miles an hour, the question has been raised whether the horizontal motion much increases the pressure that existed at its under surface. Lord Rayleigh considers that is not unplausible to say it will make no difference. We know if we had a horizontal motion alone there would be no pressure on the under surface due to the motion, and it might be argued that even in the case of the horizontal motion being superimposed on the vertical motion it would make no difference to that pressure which would result from the vertical motion alone. We are told, however, that this view is fallacious, the truth being that hori-

zontal motion much increases the pressure under a vertically falling plane, a fact on which the possibility of natural and artificial flight depends.

Lord Rayleigh ingeniously illustrated this point by a piece of apparatus which is a simple variation of the ordinary wind-mill. In this six spokes extend from a delicately suspended axle which carry at their extremities six similar vanes. These vanes can be turned so as to be set at any angle. It was explained that if these were all set at the same angle, and in the same direction, it would be like an ordinary wind-mill, and if the axle is moved forward through the air, whether the motion is a horizontal or a vertical one, the wheel would naturally be set in rotation. If the vanes were set paralled to the axis of rotation, and also to the direction of motion, then the wind would be grazing upon them, there would be no angle of inclination, no pressure, no rotation. If they were turned to 90 deg. and set perpendicular to the axis, so that they faced the wind, then, though there would be pressure upon them, the pressure would not be in the direction to rotate the wheel. The whole question is, what is the magnitude of the force tending to produce rotation? To answer this question Lord Rayleigh adopts the principle of compensation. Of the six vanes, he sets four at a particular angle, and ascertains at what angle the other two must be placed so as to compensate the rotation of the wheel produced by the former when it was moved rapidly through the air.

In the discourse, reference was also made to another interesting and important point concerning both natural and artificial flight. There is not only pressure underneath a bird's wing or an aeroplane, but also suction above. This fact was elucidated by experiment.

Regarding artificial flight on a large scale, Lord Rayleigh stated that the question whether it is possible for a man to raise his weight into the air by merely working a screw with his own mechanical power was decided years ago by Mr. Wenham, who, it may be mentioned, was recently elected an honorary member of the Aeronautical Society of Great Britain, in recognition of his valuable services to aeronautics. Mr. Wenham concluded that it was quite impracticable for a man to support his own weight by means of his own muscular power. Man is at a disadvantage compared with a bird. The latter, on account of its smallness, is at an advantage. It is true, says Lord Rayleigh, that if one man can fly we may imagine a hundred doing so side by side; but if we try to make the hundred into one big one the difficulties begin to multiply. The area of the wing becomes a difficult thing to make on a large scale, and in the case of a man the muscular power is not great. If we take the accepted estimate of man's average full muscular power, it will be found that the size of the wing required is so enormous as to be absurd. In the Professor's opinion, Penaud understood these questions years ago. Not only did he make the toy flying model exhibited in the lecture, but many others analogous to some of those exhibited more recently. These were on a small scale, but they had both aerial planes and screws. Penaud showed that artificial flight resolves itself into a question of the horizontal motion. The higher the speed at which we drive our aerial plane through the air the less work has to be done to get the maintenance. This shows that the frictional effects are essential, and unless they are taken into consideration no definite conclusion can be reached. Lord Rayleigh gave his emphatic opinion that for artificial flight the revolving mechanism is the most suitable. This has been shown both by Mr. Maxim and Mr. Langley.

As to the real practical achievement of artificial flight, Lord Rayleigh, in the true spirit of the philosopher, declined to speak very definitely, though he made it quite clear that he would not limit the possibilities of aeronautical science, and inclined to the view of ultimate success. Indeed, he went so far as to say that he was inclined to agree with Mr. Maxim that it was a question of money, and thought that if Mr. Maxim had enough of the sinews of experiment he might produce the practical flying machine. That inventor has, he said, already overcome several of the many difficulties which had to be encountered in solving the question of artificial flight. He had obtained extraordinary results in his machine, amongst which was the striking rapidity with which he raised his steam.

But, though hopeful, the Professor would not ignore the difficulties of the problem, and gave his opinion that even when artificial flight is possible, it may not be a very safe mode of travelling, one for instance that may not commend itself to an elderly lady who desires to come up to town from the country to do a day's shopping. He considers that the principal danger will be in the alighting, as there would always be the danger of getting into gusts of wind, which near the ground are apt to be irregular and might overturn the mechanism.

He adds that he has often observed birds flying near the ground in great difficulty, and losing their balance. But we may remark that even if the flying machine does not win general public favour, there will be sufficient practical uses awaiting it to justify lavish expenditure.

Major B. Baden-Powell's War Experiences.

The AERONAUTICAL JOURNAL is indebted to the kindness of Miss Baden-Powell for the following interesting news of Major Baden-Powell at the front :—

The latest news we have of Major Baden-Powell is that he, with his Scots Guards, had arrived at Bethanie. His relatives have received one or two letters every week from him describing in turn the battles of Belmont (where his servant was shot dead), Graspan, Magersfontein and Modder River.

The last letter from the Major was dated February 20th, Klip Drift, whither the Scots Guards had moved from Modder River after a long annoying period of inaction. He says : "Lord Roberts is about eight miles off trying to hem in Cronje, and we may go on any time to assist him. All going very well."

Well aware of the usefulness of his invention of war-kites, Major Baden-Powell determined to take one or more to South Africa with him, but it is reported that he could not get authority from the cautious War Office to take them as personal baggage, so endeavoured to get them transported as ammunition or arms, but this was not granted. At last he was able to get the little flying apparatus forwarded to the Cape as "medical comforts," so the story goes. It was on Modder River that Major Baden-Powell found his kite of the utmost value, making many experiments, and successfully photographing camps, tents, guns, &c., from a great height.

For wireless telegraphy the war-kites were invaluable, as Mr. Marconi's six assistants were sent to the front with their transmitters and coherers, but finding nothing prepared for them, no poles or balloons to be had, they were powerless.

Major Baden-Powell came to the rescue, lending them his war-kites, and soon extemporised several for their use. Mr. Marconi said that but for the Major's assistance in instructing them in the use of the kites, the whole Marconi paraphernalia would have been useless. Since then, however, it has worked perfectly over a distance of 85 miles.

Excellent photographs appeared in the "King," of Major Baden-Powell at Modder River, flying his war-kites.

The greatest opportunity for proving the value and utility of his invention has not yet occurred, but there is no doubt that Major Baden-Powell started from England on October 21st with great hopes in view, not perhaps as exactly some of the newspapers have it, "to sail into Mafeking, hear how is brother is, and sail out again," but certainly with the hope that the besieged might be assisted by the aid of his war-kites, by carrying in not only information but either ammunition or stores, or even men, if used under cover of night. No doubt the Major's patience is sorely taxed to be detained so far from Mafeking, when the beleaguered town is in such straits.

Aeronautical Soiree at the Royal Institution.

In accordance with the time-honoured custom that prevails at the Royal Institution of holding a soiree each Friday evening during the session, at which most of the exhibits have some connection with the subject of the evening's discourse, the soiree on January 19th, the occasion of Lord Rayleigh's lecture on "Flight" was distinguished by a prevalence of exhibits pertaining to the subject of aeronautics.

The Aeronautical Society arranged for the exhibition of the model of the Weczera flying machine, the invention of Mr. Anton Weczera, a Hungarian architect; and it was explained by Mr. L. W. Broadwell, who represents it in this country. As the subject of the machine forms part of the programme of the next general meeting of the Aeronautical Society on July 17th, when it will be exhibited and explained in Mr. Broadwell's paper, further description of the machine will be reserved for a future number of this journal. The Society also contributed several photographs of Dr. Danilewsky's aerial machine, on which a contribution from the inventor will be read on July 17th. A special request had been made by the Institution for one of Major Baden-Powell's war kites; and, owing to the prompt kindness of Mr. John Jackson, of Nantwich, a fine specimen was procured from the kite factory.

As a matter of historical interest in kite development, Mr. Eric Stuart Bruce exhibited a photograph of the great kite made for him by Mr. Douglas Archibald several years ago. This was originally intended for combination with a captive balloon, so as to steady the balloon in a high wind.

No Aeronautical Soiree would be complete if it did not include the work of Mr. Hiram Maxim. On the present occasion that was represented by Mr. Maxim's unique collection of lantern slides descriptive of his experiments.

Another feature of the soiree was the fine photographs taken from balloon by the Rev. J. M. Bacon. At the next meeting of the Society, that gentleman has promised to read a paper on cloud photography from balloons, and in his own words will describe his work, which is especially valuable to meteorology, and is one token of the close alliance of the sciences of aeronautics and meteorology.

The Pilcher Collection of Soaring Machines.

Owing to the generosity of the firm of Messrs. Wilson & Pilcher, who have presented the whole of the Pilcher collection of flying machines to the Aeronautical Society, those now historic specimens are the property of the Society, and form a substantial addition to the Museum, which it is Major Baden-Powell's wish to develop in connection with the Society.

These machines are now on exhibition at the Crystal Palace, Sydenham, the management having most courteously offered the Society ample space for their effective display.

The collection consists of:—

1. Lilienthal's Soaring Machine. With this type of machine, Herr Lilienthal met with his fatal accident, an account of which will be found in the January number of this journal, 1897.

2. Pilcher's Soaring Machine, with which he met with his recent fatal accident, an account of which appeared in the October number of the journal, 1899. This machine is exhibited in the damaged condition it was found in after it was precipitated to the earth with the unfortunate experimenter.

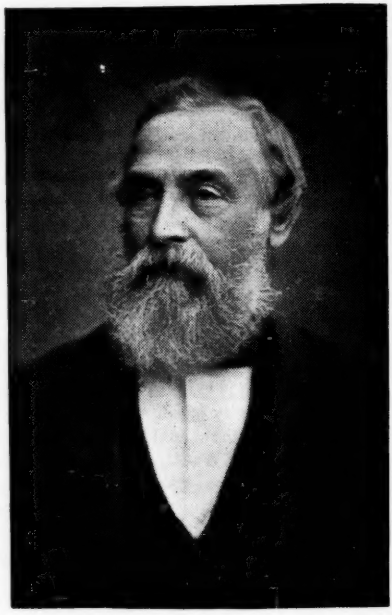
3. Pilcher's new and incompleted soaring machine. This is constructed on the principle of the Hargrave soaring kite, and consists of a large number of small wings placed in sets one above the other, and it was upon this machine that the oil engine, made by Messrs. Pilcher, was intended to be placed.

The Balloon Work of the Late Mr. Henry Coxwell.

By Eric Stuart Bruce, M.A., Oxon.

In the last number of this journal, it was my sad duty to chronicle the death of Mr. Coxwell. In another part of the same issue some aeronautical suggestions from the celebrated balloonist, bearing on the present war, appeared, showing that he maintained the ardour in aerial affairs that characterised his life to its very end.

Henry Coxwell was born on March 2nd, 1819, at Wouldham. He was the son of a gallant naval officer. From the day that,



THE LATE MR. HENRY COXWELL.

through a telescope, he espied the balloon ascent of Mr. Green, at Rochester, he conceived the passion for aeronautics, that in later years transformed the pastime into a profession, and bore results which have considerably influenced both military and scientific ballooning.

Young Coxwell began earnest life as a dentist, and for some years combined a considerable amount of balloon experience as an amateur with this profession. But the earnestness of his aeronautical talents prevailed, and in time he became the professional aeronaut, devoting himself to that calling with

the utmost ardour. Throughout his career, he endeavoured to divest balloon ascents from the mere sensational character which has so often been imparted to them, and added to the spectacle some feature of practical utility. "In the preface to the second volume of my life and balloon experiences," he says, "my chief motive for adopting ballooning professionally was not the mere idea of making money, but a desire to master the various and difficult problems of aerial navigation, so as to apply the knowledge thus obtained to military and meteorological uses." Throughout his professional ascents, he made special efforts to revive interest in military ballooning, and often included in his programme a display of signalling from the balloon car. In the work above-mentioned (page 5), he says, "So far back then as the Crimean War period, my experiments, while they met with public approval as a 'spectacle,' were far from being seriously regarded or turned to account by those in authority, and it needed many years of perseverance on my part ere a real military trial took place at Aldershot. I had hammered away in the "Times" for little less than a decade, when I was requested to be present at a sham fight, and to ascend from Thorn Hill, with Captain Beaumont, R.E., naval officers having previously made captive ascents."

Sufficient on this point has been said to show that to Coxwell's efforts must be ascribed the revival of military ballooning in this country, and the establishment of the balloon corps, the utility of which, so often questioned, is now completely proved by the success of the balloon in South Africa.

But, what principally secured Coxwell's fame were the ascents he made for scientific purposes, under the auspices of the British Association. It is true that in these ascents he merely acted as pilot, and not as the scientific observer, the researches being entrusted to Mr. Glaisher, an esteemed honorary member of the Council of the Aeronautical Society. But the successful piloting of the observer in a balloon calls for the utmost skill, and this Coxwell displayed in a manner that has made his experiences "classic." The pilot has no easy task to fulfil. He is responsible for the safety of life and valuable instruments, also for the attainment of knowledge, and often has to make a rapid decision as to how far he is justified in risking the sacrifice of the one to the other. Coxwell exercised his discretion in these respects in an admirable manner. He was daring, so long as prudence and risk were fairly balanced, but he did not allow the scale to turn too far on the side of the latter.

The successful issue of the ascents which were arranged by the British Association was largely due to Coxwell's financial enterprise. The resources of the British Association Committee for these aerial researches were so modest that they could not meet the initial and necessary expenditure of providing a new and gas-tight balloon. After some failures with an old and leaky balloon, Coxwell came forward and offered to provide a new balloon of 92,000 cubic feet capacity, which would be worthier of the elaborate programme the scientists had planned. A complete account of the British Association ascents has been published in the work edited by Mr. Glaisher, and entitled "Travels in the Air." The record teems with instances of Coxwell's skill in difficult and often perilous positions. That it was fully appreciated by Mr. Glaisher was evinced by his remarks to Section A of the British Association at the Cambridge meeting, on October 11th, 1862: "It has been fortunate for the Association and for myself that we have the assistance of Mr. Coxwell; he has the experience of more than 400 ascents, based upon knowledge of natural philosophy, and knows the why and because of all his operations, and it was this fact, which I saw immediately from the clearness of his explanations to me for each operation, that enabled me to dismiss from my mind all thoughts of my position, and to concentrate my whole energies upon my duties. In conclusion, I feel certain that if these experiments from the balloon are available for philosophic research, one of the brightest links in the long chain of useful works, performed through the agency of the Association, will be the proving that the balloon in proper hands may be made a powerful philosophic agent."

Though the whole series of scientific ascents may be said to have established Coxwell's fame as a balloonist, one ascent, in particular, claims historic interest. That was the famous ascent of seven miles, carried out on Sept. 5th, 1862, when the intrepid aeronauts ascended to within an inch of their lives. The exact height reached in this ascent has been disputed of late. Owing to Mr. Glaisher becoming insensible, no observation of the barometer was taken above 29,000 feet. The remaining feet attained before Coxwell, who was partly paralyzed, pulled the valve open with his teeth, were merely guesswork. But if the height attained has been exceeded in Dr. Berson's ascent, which is a matter of great doubt, the ascent of Messrs. Glaisher and Coxwell must have run it very close.

The memorable ascent fairly proved that at

about seven miles in the atmosphere there is the limit to human endurance of the rarified condition of the air. Perhaps, it might be slightly exceeded by inhalation of oxygen, but it is hardly likely that it could be to any great extent.

The photograph of Mr. Coxwell, which is reproduced with this article, was kindly placed at the writer's disposal for reproduction by Mr. Coxwell some years ago.

A Theory of Flight.

Read by Mr. Smyth before the Aeronautical Society, at their meeting at the Society of Arts, 28th July, 1899 :—

That the wings of all flying animals are the prime sustainers as well as the propellers of their whole systems is proved by the horizontal flying models exhibited after the reading of the paper, the speed of which models is about thirty feet per second.

As most people understand the powers concerned in sailing a cutter against wind, we may start by comparing the forces in flight with those that are analogous in the sailing of a boat, for example, a cutter. It must be known that in sailing the centre of effort (air pressure) and the centre of lateral resistance (water pressure) are very intimately connected as powers, both being the outcome of fluid pressure on surfaces, and both being absolutely necessary for the sailing of a cutter against wind.

If the wind has the power of propelling a cutter through a fluid much denser than air, and at the same time against the adverse aerial current itself, how much easier should it be to form a contrivance that could fly against adverse winds only? It is well known that a cutter of present-date construction cannot sail directly against the wind, and that a bird can. Why?

The boat is propelled by aerial pressure on one side of its surface area, depending for direction on its lateral resistance or water pressure; whereas a bird is propelled by aerial pressure on two surface areas, each counteracting the other and depending for direction on their positions relative to the vertical resistance of the whole body.

All the contrivances for forward motion in a cutter are so constructed that it would be impossible to sail her stern first against wind; for the same reason it would be impossible for a bird to fly tail first. Hence also, like boat-building, the constructing of a flying machine must be a science and an art. A science inasmuch that it depends on the application of some of the powerful laws of nature, an art because it depends on the application of rules which are liable to frequent fluctuations.

The centre of power, which is called a centre of effort, in the sails of a cutter is similar to the centre of aerial resistance of a bird's wing. A cutter depends on the force of the wind to give it propelling means, whereas a bird creates its aerial pressure, the difference being that the sail area of a cutter receives its aerial pressure more or less horizontally, and the wings of a bird create aerial pressure more or less vertically, and since aerial pressure is equal in all directions the result is the same. When a cutter is sailing against wind, the side of its hull to leeward is the only side actively concerned in its propelling means, and this is why it cannot sail directly against wind; but a bird has an active vertical resistance on either side of its body of equal powers, hence it is not prevented from flying in that direction.

Now when a bird, in its normally horizontal position of body, has its wings outstretched, the resistance to the vertical motion is due to the unsuitability of construction for progress in that direction as compared with progress ahead, but there is motion transversely to the line of its body. This motion in sailing would be called leeway.

In a bird, the centre of gravity of its system is placed low, so that it may easily keep its equilibrium; for the same reason it is placed low in the cutter. Now when a bird's body is suspended between its outstretched wings fixed for a vertical resistance, as seen when descending from a height, all that is required of it for its forward and downward gliding movement is that it should keep the centre of gravity of its whole system as nearly as possible immediately below the centres of vertical resistance of its whole active surface. This it is able to do by placing its wings a little forward or backward instinctively, which would bring the angle of propulsion to a descending one, the degree of angle according to position of centres of powers of aerial pressure and gravity, and strength of rear portions of the wings. Now if the centre of gravity were immediately below in a vertical direction to the centre of vertical resistance of *rigid* wings, it would in still atmosphere naturally descend in an absolutely vertical direction, but as the wings are not rigid, this motion would be very difficult and would compare with a boat that was making no headway, but

merely moving to leeward, to accomplish which, the sail area would have to be placed at a very awkward angle, viz., to windward of the centre line of the boat.

This position of centres of powers is equivalent to the relative positions of the centre of effort and centre of lateral resistance concerned in sailing, especially for sailing against wind, the centre of lateral resistance should be approximately in a line at right angles to the centre line of a boat through the centre of effort, otherwise the rudder would have to be used to keep the boat from sailing in another direction.

Why should a bird with outstretched wings when dropping from a height glide forward, allowing for the above relative positions of the centre of vertical resistance and centre of gravity? Now we come to the essence of the Theory of Flight, and for this lesson we owe principally to the law of gravitation. This motion is more analogous to leeway made by a boat than actual leeway made in flight across winds, the pressure being in the one (bird's case) vertical, and in the other (boat's) lateral; wind being the propelling force in the one, the attraction of gravity causing aerial pressure in the other. With a bird with outstretched wings, as before mentioned, we have two powers acting one against the other, and both in a vertical direction, the power of gravitation showing us the power of the contrivance for forward motion, the latter power being practically an upward vertical aerial pressure.

Presuming the wings in surface area are as nearly as possible horizontal to the centre line of its body, just as the bird leaves a height in still atmosphere the body immediately commences to fall, the tendency being of course by natural law in a vertical direction, but the fall is broken chiefly by two wings, which are more rigid in their foremost or advancing edges than in their rear portions. Becoming very much more flexible in their extremities, it naturally follows that the rear portions yield, creating a pitch, the angle of which would be gauged at right angles to the direction of power creating it, which, of course, would be gravitation, therefore a vertical power. The angle of the pitch would vary at different parts of the wing area, being greatest at the extremities, but naturally corresponding in each wing. The rigid advancing edge of each wing acts as a dam in order to increase aerial pressure on the rear portions, which it does by preventing air escape towards the advancing edge.

Now let us apply this gliding theory to that of flight. All the power necessary to send the bird a certain distance forward, was its own weight, that is to say the aerial pressure necessary under the wings required to glide a certain body would be, as the bird's weight to its wing area, and for example let us take the weight of the bird to be two pounds, and the wing area two square feet, therefore the aerial pressure necessary would be that which results from the fall of one pound per square foot of wing area.

Now, if this power is arrived at by merely stationary wings on a falling body, what would be the power of aerial propulsion with wing revolutions at the rate of some hundreds or thousands per minute, causing several pounds pressure per square foot? It naturally follows a greatly-increased speed of motion would be attained.

It must be known that the sustaining power of a bird depends on the angle of its whole surface area, or when flapping the mean plain between the upward and downward stroke to a line drawn through the centres of two powers, viz., the centre of vertical resistance and the centre of gravity of its whole system; that is the sustaining power of an aeroplane depends on the angle of the active plane-surface to (the centre of power causing its activity), the centre of gravity of its whole system, and is greatest when the line drawn through the centre of that power is at right angles to the surface through the centre of vertical resistance of the aeroplane, no matter at what angle to the horizon. This must be so, for, alter this angle of aeroplane to the line through the two centres of power, and your aeroplane becomes a gliding machine. With temporary weight-supporting contrivances, such as parachutes, gravitation is the power causing activity, hence a vertical power, but gravitation is acting on the whole contrivance, chiefly through the centre of gravity of the whole system of the parachute which would be in the suspended weight. But the whole system may roll through aerial currents which alter the angle of the active surface area to gravitation's attraction, but not to the centre of gravity of the whole system, hence the form of contrivance. *This proves that the angle of an aeroplane to the horizon has nothing to do with its sustaining power.*

Now when an aeroplane is used to more or less sustain or to decrease the sudden fall of any weight in the atmosphere, the centre of gravity of the weight would be the centre of power opposing and causing the power of contrivance, and if in still atmosphere this weight be so placed that a line through its centre of

gravity remains at right angles (or at equal angles) to the surface area, it naturally follows the whole system, or contrivance, must fall in an absolutely vertical direction, no matter what shape the aeroplane may be.

For the sake of example, we will call one end of the aeroplane the *bow*, the opposite the *stern*. Let the angle of aeroplane to weight suspended through their centres of power be altered so that the bow will dip towards the horizon, allowing, of course, for the centre of gravity of the whole system to be immediately below the centre of vertical resistance in still atmosphere. Now what was previously a form of parachute, a contrivance merely to break the fall of a weight, is a gliding machine, that is a contrivance which will alter the fall of any weight from the vertical.

Now the angle between the present position of the aeroplane and its previous position, is the pitch giving the whole system a power of propulsion, which naturally prevents its falling in an absolutely vertical direction, for fluid pressure exerts its power in a direction at right angles to the surface area. Hence, if this line of direction were continued through the inactive surface of the aeroplane, it will show the attempted direction of flight of the contrivance; but since the power of gravitation is so much greater than the power of the aeroplane, the whole system takes a descending angle according to the density of the atmosphere or fluid through which it passes, and the relative strength of the two prime active forces, gravitation and aerial pressure. This is exactly analogous to leeway made by a sailing boat, showing also the cause of forward direction made by lateral fluid pressure on sail area.

As has already been shown, propelling means results from the rear portions of wings being less rigid than their advancing edges; this is so in all animal flight. The angle of the pitch of the wing areas in most flying animals may also be altered from their sockets by muscular power; but this power, as is easily seer, is not necessary in horizontal flight, as too great a pitch would tend to bar progress in that direction. It may, however, be used in ascending and alighting under certain conditions, when the angle of the body is considerably altered from its previous normally horizontal position.

It is plainly seen that fluid pressure on surface area is the sustaining and propelling power, and that the angle of the active area relatively to a line through the centres of vertical resistance and gravity of the whole system controls the line of flight.

Recent Publications.

"Sailing Birds are Dependent on Wave Power." By L. Hargrave. Mr. L. Hargrave has recently read before the Society of New South Wales a paper entitled "Sailing Birds are Dependent on Wave Power." He remarks that when large flocks of birds accompany vessels running down their easting they afford the opportunity of determining whether sailing birds really can work to windward; this fact can only be settled by an observer aboard a steamer going westward and south of what it is believed is the usual track from Australia to the Cape.

Mr. Hargrave has formed an opinion that sailing birds cannot make anything to windward except during the short period that the sea is running in an opposite direction to the wind. As an argument, he calls attention to the absence of sailing birds in the S.E. trades, an absence which he attributes to their inability to get out of the trades by standing to the S.W. if they get too far to leeward.

"The most ordinary conditions for observing sailing birds are when the wind and sea are both aft. The waves are probably overtaking the ship and passing at about six knots. Large numbers of birds follow the vessel and make wide circuits on either side of the wake; their interest is centred on garbage, and their efforts are directed to keeping astern, their weight and area are such that they must keep moving through the air at a nearly uniform speed in order that they may be supported; this velocity I estimate at forty miles per hour.

"If you direct your attention to the position of a bird *with regard to the wave surface*, it will speedily be noticed to be nearly always on the rising side or face of the wave and moving *apparently* at right angles to the wave's course, but really diagonal to it.

"The bird is going to leeward as fast as the wave is; and, if that speed is too great for its requirements, it turns towards the crest, points one wing to the sky and uses its velocity to shoot upwards high above the back of the wave, and then descends to the trough of the following wave, along the face of which it glides; the back of the wave is its peculiar aversion. Now there has been no flapping, and the performance takes place with or without wind, all the bird requires is the wave.

"As to the effect of the wave on the air, we will suppose the water to be quite flat and the air motionless, a heavy undulation comes on the

scene, it has to pass, so it pushes the air up with its face, letting it fall again as its back glides onwards. The air on the face is slightly compressed, that on the back lowered in pressure, both operations taking power out of the wave, and eventually largely contributing to its extinction.

"The closer the bird is to the surface of the water, the firmer and more inelastic is the uplift of the rising air. The bird appears to almost feel the surface with the tip of its weather wing.

"The case I wish you to consider is that of a sea-wave, for example, one hundred and eighty feet long and ten feet high, travelling at eighteen knots, or, say, thirty feet per second under *calm* air. This wave will raise all the air as it passes ten feet, at the mean rate of three and one-third feet per second.

"The rate will vary from zero in the trough, attaining its maximum velocity at half the wave height, or where the wave is steepest, and falling to zero at the crest. Let us suppose the maximum velocity of uplift of the air to be about four feet per second and the steepest part to be 10° slope.

"Now, according to Prof. S. P. Langley, a plane surface 30″ × 4·8″, weighing 1·1 lbs., will glide on air, without losing its elevation, at a speed of 49·8 feet per second, if sloped 5°. That is, the plane pushes 4·33 feet of air vertically downwards, whilst it is translated 49·8 feet in 1 sec.

"The same effect with regard to the position of the plane at the end of its journey of one second's duration is produced if the plane be sloped 5° downwards, and the air through which it passes be pushed bodily upwards 4·33 feet in one second.

"Now the air over our wave is being lifted about four feet per second; so if the 1·1 lb. plane were launched with 5° downward slope in the same direction the wave is travelling, from one foot above the steepest part of the wave, it would overrun the wave which has only a velocity of thirty feet per second. It would thus get out of the air that is being lifted and shoot into the water in the trough. But if the aspect of the plane be changed so that it face 53° either to the right or left of the track of the wave, its position above the mean sea level and situation on the wave slope will be unaltered; and, if the wave was of unlimited width, the plane would continue on its course till dashed ashore.

"The plane is simply abstracting the power stored in the wave by a distant gale, and using it to counteract gravity. And if the work be continued long enough, or a multitude of planes be continually drawing on the reservoir of power, the wave must inevitably be flattened.

"The velocity of 49·8 feet per second is sufficient to raise the plane to an elevation of thirty-eight feet in one and a half seconds, if its course be changed from horizontal to vertical it there comes to rest. And from a poise at this station the plane may swoop down, at great disadvantage if close to the back of the wave, at various slopes and directions till it cuts into the air that is being raised by the face of the following wave, which again enables it to resume its velocity.

"Observe that the wave I instance in this example is one of the low round-topped sort that prevail in calm weather. If we were to base our calculations on a wave with a sharp crest approaching to the breaking dimensions, our plane would be travelling on its course through air having a velocity of uplift of 30 instead of 4·3 feet per second, if the wave slope were 45°; and would need loading approximately to $\frac{30}{4\cdot3} \times 1\cdot1 = 7\cdot6$ lbs. per square foot to keep it down to its original mean height, and could be made of seven gauge wrought iron.

"If we figure out the result with 2° angle of incidence, and a horizontal velocity of 65·6 feet per second, we find that the 1·1 lb. plane will be supported where the wave face is only 4½° slope, giving a velocity of uplift of 2·289 feet per second, and will make a course 62° 40′ to the right or left of that of the wave. Couple this with the fact that the head resistance of a sailing bird's form and the delicate arch of its wings are the survivals of untold numbers of cruder types, and no surprise should be felt at any intricate tactics pursued when further aided by the power derived from the wind and roughened sea."

Mr. Hiram S. Maxim in a communication to the Editor thus comments on the questions raised in this paper:—"It is quite true that Mother Carey's chickens, and a good many other birds, take advantage of sea-waves in flying. I have observed them myself. They always occupy a certain spot as relates to the wave. The wind is of course blowing at a greater velocity than the waves are travelling. It therefore is deflected upwards by the wave, and the bird balances itself in this upward blast of air. The bird itself is falling as relates to the air, but may be actually rising as relates to space. But Mr. Hargrave is mistaken when he says the same thing takes place in a dead calm,

when the air is motionless. Such a thing is absolutely impossible. I have observed sea-birds during many voyages, and I have never yet seen one of them sustain itself in the air except in a rising current—never in a calm, and Lord Rayleigh agrees with me exactly on all of these points. The fact is I wrote a book (which is not yet published) some years ago which sets forth in a very clear manner how birds fly. Every sort and kind of bird has to work its passage, if it is flying in absolutely calm air where there are no upward drafts. A seagull will follow a ship for hours without a particle of exertion, but it always is in an exact spot as relates to the ship. The bird always seeks a place where the two currents of air which are formed by the ship come together, at the stern of the ship, and where in coming together they produce an upward current. The gull seeks out this spot, and as one might say, roosts upon it with no more exertion than a common barnyard fowl would exert in roosting on a stick; but when it becomes necessary for him to pass out of this current, or change his position, and whenever he gets into a descending column of air, he then has to work his passage very much like other birds. I have not only observed this very much at sea, but also on land, and I think Mr. Hargrave assumes too much when he claims that the simple lifting up and down of the air without any onward motion at all might enable a bird to sustain its weight in the air without any motion of its wings."

NOTES.

The Grand Prize of the Paris Aero-Club.—There is a chance now for aeronauts of every nationality not only to distinguish themselves by inventing a navigable balloon or flying machine, but also to win a substantial money prize. The Secretary of the Paris Aero-Club has requested the "Aeronautical Journal" to make the following particulars known to the members of the Aeronautical Society of Great Britain and the readers of its journal.

A member of the Aero-Club, who has withheld his name, in his desire to forward the solution of the problem of aerial navigation, has offered a prize of 100,000 francs to the aeronaut who, either in a balloon or flying machine, starts from the grounds of the Aero-Club at Longchamps and makes a journey round the Eiffel Tower, returning to the starting place within half an hour, the utmost limit allowed. The distance is about 6½ miles. The competition is international, and the decision is in the hands of the club. If the prize is not won in five years the donor will withdraw his offer, but during this period he will pay the interest on that sum, that is to say, 4,000 francs annually, for the purpose of rewarding the experimenters who fail to accomplish the task, but who seem desirous of encouragement. The rules of the competition will be published frequently. Those who wish to obtain further information on the subject should apply to M. Emmanuel Aimé, the general secretary of the Aero-Club, 48, Rue de Colisée, Paris.

It is earnestly hoped that in this competition the members of the Aeronautical Society of Great Britain will be represented.

The Triumph of the Balloon in South Africa.—In the article, "The Balloon at the Front," published in the last issue of this journal, some examples of the utility of the balloon in South Africa were quoted. It would take another long article to chronicle with any justice their value during the months of siege and battle that have passed since the article was penned. The public have, however, been kept fully acquainted with their use in the present campaign in the daily papers, illustrated weekly journals, and popular magazines. These have literally teemed with notes and articles on the military balloons, and in many cases the illustrations are excellent.

Foremost amongst the occasions when the balloon has proved to be the eagle eye of an army was that when General Buller's force, marching to relieve Ladysmith, was saved from a deathtrap solely by the balloonists.

The "Practical Engineer" speaks to the purpose when it says: "Undoubted advantages have accrued from the employment of balloons in South Africa. Had it not been for their use among the rocky hills and kopjes—where masked batteries and impossible roads were more than once revealed—our operations in many dreary districts would have been attended with much greater loss than has actually been experienced. The lessons thus learnt should instigate the carrying out of more searching experiments nearer home. By means of a balloon sent up from Portsmouth Dockyard a few days ago, it was discovered that an excellent view can be obtained of the long chain of forts and entrenchments that cover the downs a few miles northward. Investigation is now about to be carried further. A body of aeronauts, furnished

with the requisite appliances, are to be placed on board a warship, and ascents arranged at various points as it steams along the coastline. By this means the authorities will be able to satisfy themselves as to the distance from which batteries at Dover, Plymouth, and other places can be discerned, and to what extent masses of armed men are brought under observation. Much will depend on the information obtained in this way, because, if guns and reserves are too plainly visible, it will be necessary to supply more effective cover than has hitherto been deemed essential."

The opinion of the Boers themselves on the value of balloons is worthy of notice. The besieged war correspondent of the "Daily Telegraph" tells us how the Boers dreaded the far-seeing eye of the balloon, so opposed to their system of warfare. One of their prisoners is reported to have said, "If we ever get hold of the man in the balloon, we'll make mince-meat of him. He is the one who does us most harm. We could not move, we could not creep from one stone to another but he saw us, and pointed us out, and we'll pay him for it if we lay hands on him."

Men of the Moment.—"Public Opinion" of March 9th, 1900, gives some interesting details concerning the life of Major Baden-Powell:—

"Major Baden Fletcher Smyth Baden-Powell, of the 1st Scots Guards, now with Lord Methuen's Division, who has rendered such important services by his arrangements for signalling and observation of the enemy, is the younger brother of the gallant defender of Mafeking. Born in 1860, he joined the Scots Guards from the Militia in 1882, and became Captain in 1896. He first saw active service with the Soudan Expedition of 1884-85, winning the medal and clasp and the bronze star. He is remarkable as the introducer of the kite in warfare. His invention is a series of box-shaped kites strung together and capable, even in a moderate breeze, of raising a man for purposes of observation. He also invented a method of attaching a camera to a kite, and so photographing the disposition of the enemy's forces. Both inventions have been used with success in the present campaign, the advantage of the kite system being that the apparatus is very compact, and can be carried where the more cumbrous balloon-trains are unable to venture."

There is a slight error in this account which may be pointed out. The box-shaped kite is the invention of Mr. Hargrave. Major Baden-Powell designed the hexagonal-shaped kite, which folds up, and is unequalled for its portability.

Electric Balloon Signalling at the Paris Exhibition.—In Group XVIII. of the Paris Exhibition in the Military and Naval Section, there will be an exhibit of the latest improvements in the electric translucent Bruce Balloon for flashing signals by night at great altitudes. A new form of this invention, devised for portability in the field and capable of being used by army signallers without any cumbrous appliances, will form the subject of one of the papers at the forthcoming meeting of the Aeronautical Society on July 17th.

A New Flying Machine.—According to *The Daily Graphic*, the Flying Machine invented by the Russian Feodoroff and the Frenchman Dupont should have a good chance of winning the prize of the Paris Aero-Club. It is made of metal, driven by a gas engine, generated from liquids, and is capable of travelling at the rate of 100 miles an hour. It is made to carry one person, and is so easily guided that it is proposed to exhibit the machine performing evolutions in the air in time to music.

Novel Use for Balloons.—An interesting note appeared in the "Globe" last month describing a new practical use for balloons. It appears that M. Letorey, a French architect, has applied the captive balloon to the cleaning or decorating of cupolas, high roofs, towers, and monuments. The balloon is raised and lowered from a waggon by a windlass, and steadied by stays from the side of the envelope. It has two platforms, one on the top, the other underneath, and these communicate by a ladder up a central tube. The "Globe" suggests that such a balloon scaffold might be applied to such operations as now require steeplejacks, such as the wreathing of Nelson's column.

The Number of Coxwell's and Goddard's Balloon Ascents.—The "Newcastle Chronicle" has recently pointed out that some are under the impression that Coxwell made a greater number of balloon ascents than any other person. This, it points out, is not the case. It does not hesitate to ascribe to Coxwell the honour of having ascended higher than any other balloonist, but it states, as a fact, that the record of number of ascents belongs to Mr. Goddard, who made over 2,000 ascents.

The First Use of the Balloon in South Africa.—It is, perhaps, not generally known that the balloon was used in South Africa before the present campaign. This has been lately pointed out by the "Illustrated Sporting and Dramatic News." As that journal mentions, with Sir Charles Warren's Bechuanaland Expedition there was a Balloon Corps under the late Major Elsdale, which included three balloons. It was at Mafeking that the first military use of a balloon was made. Major Elsdale and Sir Charles Warren ascended, and the latter kept up communication with those below by flag-signalling. The Native Chief Montsiora was present. When standing apart from the rest, he remarked, "If the first white men who came into the country had brought a thing like that, and having gone up in it before our eyes, had then come down, and demanded that we should worship and serve them, we should have done so. The English have indeed great power."

Obituary.

Though the work of the late Professor Hughes was not directly concerned with aeronautics, there are more reasons than one why a few words in memory of the illustrious electrician should appear in the obituary column of this journal. Though so thoroughly specialistic in his own particular branch of science, it may be truly said that the Professor extended his sympathies to most departments of natural science, and was exceedingly enthusiastic concerning the recent developments in aerial matters, especially concerning the application of electricity to balloons so as to secure a means of visual signalling at great altitudes.

It is not generally known, but none the less true, that Professor Hughes was the first to discover what is now called Hertzian Radiation, upon which the modern development of wireless telegraphy is based. This system will in the future probably call in the use of balloons on a very large scale. Of so humble a mind and of so unselfish a character was Professor Hughes that he made these great discoveries without seeking the slightest public recognition. But all the same, posterity will call him the master electrician of the century.

It is with regret that we have to record the death of Colonel Elsdale, R.E., a member of the Aeronautical Society, eminent for the services he rendered to the cause of military ballooning during the time he was in command of the balloon section at Chatham. Colonel Elsdale's death occurred when he was on his way home from Hong Kong.

Foreign Aeronautical Periodicals.

L'Aeronaute (Paris). (Not received this quarter.)

La France Aerienne (Paris).

1—15 *January*, 1900.—Les Expériences d'Aviation au Jour le Jour.—A Montmartre au sommet de la Butte Sacrée: Docteur Ox.—Encore à propose des Expositions Colomphiles: E. Caillé.—La France Aérienne à l'Etranger.—Revue de Presse.—Les Pigeons Voyageurs et les Chasseurs. A la Volée. Les Cours d'Aérostation Militaire.—Cinématographie Aéronatique, &c., &c.

15—31 *January*, 1900.—Colombophilie Militaire.—Les Pigeons et les Armes à Feu.—Les Pigeons Voyageurs dans le Sud de l'Afrique. A la Volée.—L'Aéronautique et la Colombophilie à l'Exposition de 1900.—Mort du Capitaine Coxwell, &c., &c.

1—15 *February*, 1900.—L'Aéronautique au Jour le Jour.—"1900": Lieutenant V. Louet.—L'Aéronautique à l'Etranger. Expériences du Comte Carelli en Italie.—Un Nouveau Dispositif Aérien: Appareil de M. Firmin Bausson, &c., &c.

15—28 *February*, 1900.—L'Aurore du XX. Siècle: C. Jobert.—Les Journeaux de Sport et le Comité de l'Exposition.—Le Ballon Zeppelin.—Revue de Presse Etrangère.—The Aeronautical Journal, &c., &c.

1—15 *March*, 1900.—La Colombo-biculture parisienne depuis les temps les plus reculés jusqua nos jours: Paul Wacquez.—Féderation Colombophilie de Seine-et-Marne, &c., &c.

L'Aerophile (Paris).

January, 1900.—Portraits d'Aéronautes Contemporaines: Mme. Dorothée Klumptre (Wilfrid de Fonvielle); Une Station d'Aéro

station Météorologique à Berlin (Gustave Hermite); Une Ascension à Bord de l'Aéro-Club (Une Débutante).

February, 1900.—Portraits d'Aéronautes Contemporains: Eugène Godard II. L'Aéronautique à L'Exposition de 1900; Les Ballons Militaires en Afrique Australe (Paul Ancelle), &c.

ZEITSCHRIFT FUR LUFTSCHIFFAHRT (Berlin).

January, 1900.—Fortsetzung de Betrachtungen über Eine Kinetische Theorie der Luftbewegungen: Emil Jacob.—Flugtechnische Betrachtungen II.—Ralmund Mimführ, &c., &c.

ILLUSTRIRTE AERONAUTISCHE MITTHEILUNGEN (Strassburg).

January.—Die Beanspruchung des Netzes am Freibullon: Prof. Dr. S. Finsterwalder.—Die Herstellung de Ballonstoffe: Oberlieutenant E. Dietel.—Das Luftschiff des Grafen von Zeppelin: Hauptmann H. Moedebeck.—Ballonfahrt des Oberrheinischen Vereins für Luftsschiffahrt am 5 October, 1899: Stolberg.—Ballonfahrt des Oberrheinischen Vereins für Luftschiffahrt zur Beobachtung der Leoniden am 16 November, 1899: Leutnant Hildebrandt, &c., &c.

Notable Articles.

Jan. 5. *English Mechanic.*—"Air-Ship or Aeroplane. Which?" Letter by Thomas G. CHALLIS.

6. *Pall Mall Gazette.*—"Death of Mr. Coxwell."

11. *Admiralty and Horse Guards Gazette.*—"The Pioneer Mail."

25. *Standard.*—"War Balloons and International Law."

27. *Illustrated London News.*—"Major Baden-Powell's War Kites." (Illustrated.)

Feb. 6. *Standard.*—"Weather Forecasts by Balloon."

10. *County Gentleman.*—"Balloons in Naval Warfare."

14. *Manchester Guardian.*—"The Wilde Lecture."

Mar. *Feilden's Magazine.*—"The Balloon as a War Machine." By H. LAWRENCE SWINBURNE. (Illustrated.)

Charing Cross Magazine.—"Shall We Fly." By Major C. FIELD.

6. *Pall Mall Gazette.*—"The Eyes of an Army."

16. *Engineering.*—"Mechanical Flight." Letter to the Editor by HORATIO PHILLIPS.

The following List of Applications for Patents connected with Aeronautics has been specially compiled for the *Aeronautical Journal* by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.:—

Applications for Patents.

(*January, February, March*, 1900.)

1,060. January 17. CHARLES HENRY HEATH TIFFIN, 20, Lyme Street, Camden Road, London. **The Automatic Photo Detective Balloon.**

1,162. January 18. HERBERT SEFTON-JONES, of the Firm of W. P. Thompson and Co., 322, High Holborn, London. **Improved Navigable Aerostat.** (Hippolyte Francois and Bernard Coutour, France.)

1,415. January 23. PIETTRO ALLINIO, 15, Water Street, Liverpool. **Improvements in Air Ships.**

1,797. February 3. CHARLES MERNINGTON, 18, Avington Grove, Penge. **Improvements in War Balloons and Means for Reconnoitring.**

2,135. February 3. ARTHUR CHARLES SPENCER, 33, Chancery Lane, London. **Improvements in, or Connected with, Captive and other Balloons.**

3,364. February 20. EDWARD ANDERSON, 70, Chancery Lane, London. **An Improved Flying Machine.**

3,793. February 27. ARTHUR HENDERSON, SIDNEY PATTISON, and MARK GOLINSKY, 16, Claremount Road, Surbiton, Surrey. **Improvements in connection with Balloons and other Aerial Machines.**

3,926. February 27. AUGUST RIEDINGER, 18, Buckingham Street, Strand, London. **Improvements in and Relating to Balloons.**

4,036. March 2. THOMAS MAY, 8, Quality Court, Chancery Lane, London. **Improvements in or Relating to Means and Appliances for Effecting Aerial Navigation.**

4,072. March 2. WM. PEAKE, 39, Lockhart Road, Moor Park, Preston. **An Improved Method in the Construction and Propulsion of Ships and other Bodies Floating in Air or Water.**

4,154. March 5. GEORGE GRANT, 114A, Chancery Lane, London. **A New Extendable or Collapsible Keel for Aerial Navigating Machines, or Aerial Apparatus, or Aerial Yachts, and the like.**

4,398. March 7. GEORGE VON SCHOENERMARCK, 18, Buckingham Street, Strand, London. **Improvements Relating to Air Balloons and Means for Guiding same.**

Patent Published.

22,103. October 20. **Aerial Machines and Anchors therefor.** ROZE, L. E., 6, Cité Bergère, Paris. [Date claimed under SEC. 103 of PATENTS, &c., ACT, 1883, March 21.]

Notice to a Correspondent.

The Honorary Secretary of the Aeronautical Society will be obliged if the gentleman who lately forwarded six stamps for McCallum's "Navigation of the Air," will send his name and address to him, 19, Campden House Road Kensington, London, W.